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Building Commissioning

Energy 2003

Types of Commissioning for New Construction / Installations

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- Commissioning (Cx) for New Construction
- Commissioning for full renovations
- Commissioning for major retrofits (equipment replacements)

New Stuff

Primary Commissioning Goals

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1. Ensure design intent criteria and the owner's requirements for the project are documented and met
2. Ensure systems and equipment are fully functional and operate in an integrated manner

Primary Commissioning Goals cont.

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3. Gather and provide comprehensive documentation that assists in operating and maintaining the building throughout it's life
4. Verify that the operating staff receives adequate training

Types of Commissioning for Existing Buildings

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- Existing-Building Commissioning or Retrocommissioning (RCX)
- Recommissioning (ReCx)
- Continuous Recommissioning

Goals for Retrocommissioning

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1. Update or create design intent and other building documentation
2. Optimize building performance
3. Enhance O&M documentation
4. Train operating staff throughout the course of the project

Why Commission?

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- Owners do not typically receive fully functional building systems
- Owners face increasing numbers of performance problems
- Buildings have more complex life safety, security, communication, and comfort control systems
- Building systems are becoming increasingly specialized and integrated?

Why Commission?

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- Multiple trades and contracts are involved (fragmentation)
- Conflicting loyalties and objectives
- Increasing costs (change orders, call backs)
- Emphasis on fast track
- Design fees do not reflect reality
- Requirements – LEED, CHPS, Codes

Benefits of Commissioning

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- Smoother turnover (fewer call backs)
- More complete documentation
- Tenant (user) satisfaction
- Lower utility bills
- Avoided O&M costs
- Increased equipment reliability
- Improved Net Operating Income (NOI)
- Provides a benchmark

What Does Commissioning Cost?

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CX Cost for New Const.

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Cost Guideline for Cx Provider's Fee:

- 0.5 to 3% of total const. costs
- 1.5 to 2.5% of the mechanical contract
- 1 to 1.5% of the electrical contract

$0.50 /SF → $3.00/SF

Office **Classrooms** ***(Simple)***	**Office** **Correctional** **Lab classrooms**	**Office** **Hospitals** **Research** ***(Complex)***

Construction Phase CX Costs

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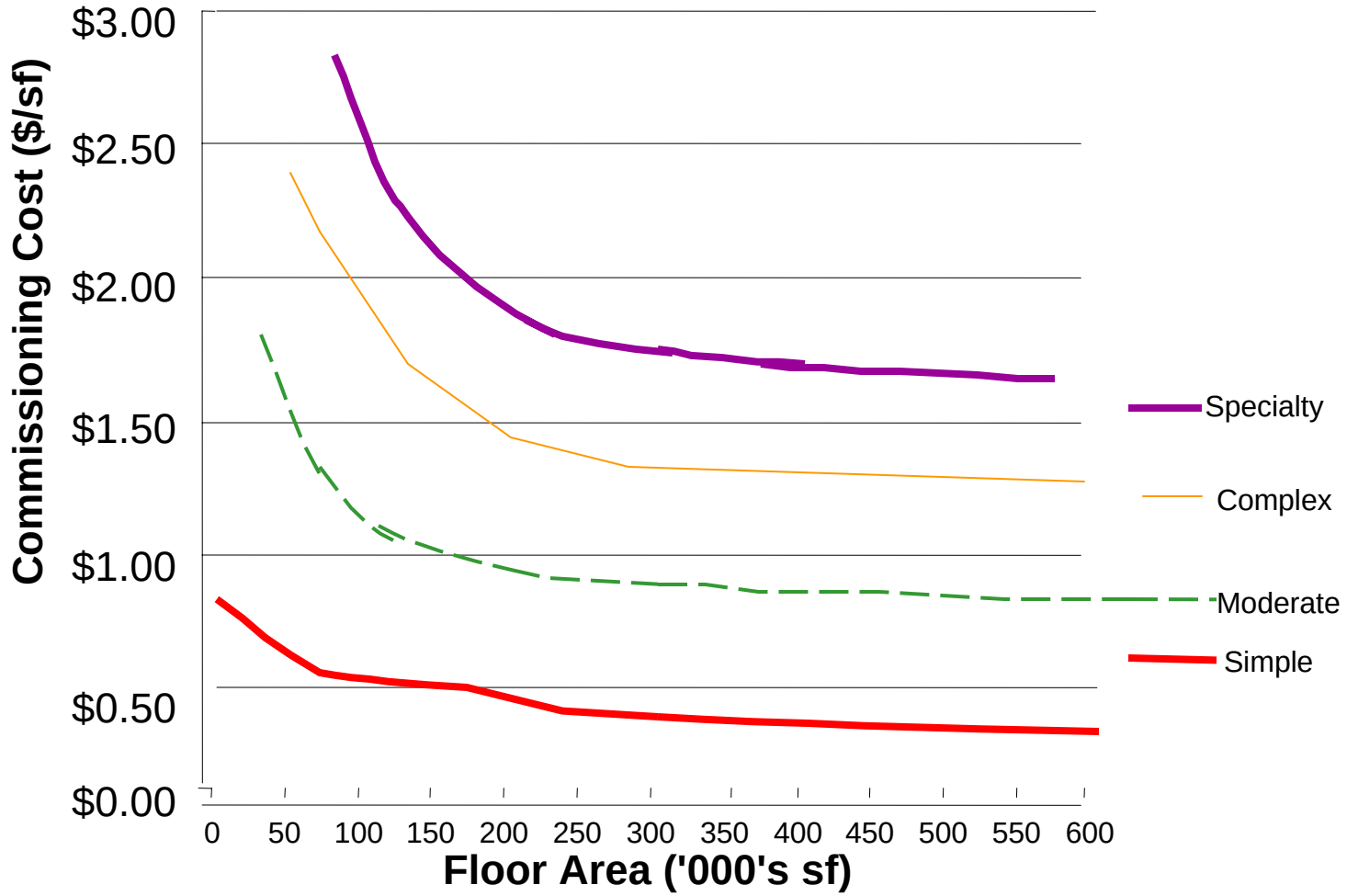
(Costs for Commissioning New Construction, per sf)



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Retrocommissioning Cost & Savings

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From Study of 44 Buildings:

Bld. Type	RCX Cost	Savings/yr	Payback
Highrise Office	$12,745	$8,145	1.6
Medical Institution	$24,000	$63,502	0.4
Computer / Office	$28,000	$30,385	0.9
Retail	$52,336	$42,500	1.2

E-Source study of 44 buildings Size ranged from 80,000 to 887,000 sq. Ft. Cost range from $5,000 to $52,000

What influences Cx Costs ?

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- **Complexity** (building use or type, system type)
- **Project Objectives** (single or multi-focused)
- **Scope of the project** (single building or campus, pieces of equipment or number of systems)
- **Availability and expertise of building operators**
- **Location**

Who Needs to be Convinced?

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- Building Operators!
  - As part of the building operations staff, What's in it for me?
- Building Owner(s)
- Upper Management (CEO, CFO)
- Facility Manager
- Building Occupants

Preparing for a RCx Project

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Before Getting Started ask:

- Is RCX appropriate?
- What resources are available?
- Who needs to be convinced?

Is Retrocommissioning Appropriate?

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- Does the building have unjustified high energy use per square foot (BTU/sq. ft.)?
- Are there excessive comfort complaints or trouble calls?
- Are a majority of the systems or equipment in need of replacement (outdated or at the end of their life)?

Is Retrocommissioning Appropriate?

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- Are there any catastrophic problems (asbestos, oil or water in the pneumatic lines, etc.)?
- Are there (known) major system design problems?
- Are there any other questions you can think of that may or may not make a building a good candidate for RCx?

What Resources are Available?

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- People
  - In house staff
  - Contractors
  - Commissioning experts
- Programs
  - Educational
  - Utility
  - Government
- Budget

Four Phases of a RCX Project

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- Planning
- Investigation
- Implementation
- Hand-off

Major Planning Phase Elements

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- Select the in-house team
- Define the scope, objectives and deliverables (work products)
- Hire the CX provider
- Develop the RCX Plan
- Define lines of communication and work protocols

Typical RCx Project Objectives

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- Improve comfort
- Identify low cost energy saving opportunities
- Identify retrofit opportunities
- Improve indoor air quality (IAQ)
- Increase equipment reliability (reduce chances of premature failure)
- Update and enhance documentation
- Provide operator training
- Identify fire, life and safety issues
- Review or develop a preventive maintenance plan

Why Hire a Provider?

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- New Perspective
- Broad Range of Experience
- Special Expertise and Tools
  - Engineering Analysis (cost/savings)
  - Diagnostic monitoring and testing
- Low Investment in doing things the "Old Way"

Obtaining Third-Party Services

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- SOQ process
- RFP process
- Selection / negotiation with prequalified contractors

What about Certification?

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- At this time there is no universally accepted certification to help owners in selecting qualified Cx Providers
- The Building Commissioning Association (BCA) is working to develop a certification process. Periodically check their web-site for an update about the process. www.bcxa.org

Deliverables

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- Progress Reports
- Meeting Minutes
- The Plan
- Preliminary Report with a Master List of Findings and Recommendations
- Service Contract Review
- Recommissioning Manual
- Final Report

Retrocommissioning Plan Elements

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- General Building Information
- Project Objectives and Scope
- Brief Building and Systems Description
- Roles and Responsibilities
- Work Protocols
- Documentation Requirements
- Schedule
- Testing and Diagnostic Plan Outlines
- Implementation of Recommendations
- List of Deliverables

How Building Operators Can Reduce RCX Costs

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- Gather up-to-date building documentation
- Perform appropriate preventive maintenance tasks prior to RCX
- Be prepared to perform simple repairs and improvements as the project progresses
- Assist with diagnostic monitoring and functional testing
- Implement or assist with implementing the selected improvements

Kick-Off Meeting

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Purpose:

- To discuss and agree to the Retrocommissioning Plan
- To clarify the key roles and responsibilities of commissioning team members
- To identify and agree to schedules
- To impart the owner's objective for the project
- To define the work protocols

Major Investigation Phase Elements

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- Gather and develop building documentation
- Perform the O&M Site Assessment
- Develop the Master List of Findings
- Perform analysis to determine which improvements provide the greatest benefit and meet the owner's objectives

Functional Testing

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- Functional testing in conjunction with data and trend logging
- Manual testing

Implementation Phase

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- Implement the Selected Cost-Effective Improvements
- Develop an implementation plan and budget
- Retest, Remonitor, and Fine Tune
- Revisit Initial Energy Savings Calculations

Hand-off Phase

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- Complete the Final Commissioning Report
- Develop Recommissioning Strategies
- Operator Training
- Hold a Project Close-Out Meeting

Thanks!

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